

Delft3D

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Delft3D, is a three dimensional modelling suite to investigate hydrodynamics, sediment transport, morphology and water quality for fluvial, estuarine and coastal environments.

General features:

Hydrodynamic

The hydrodynamic module solves the equation of motion, and continuity equations which are derived from the three dimensional Navier-Stokes equations for incompressible free surface flow.

Among others, the following processes can be taken into account: Turbulence induced mass and momentum fluxes (turbulence closure models); Free surface gradients (barotropic effects); Water with variable density (equation of state); Horizontal density gradients in the pressure (baroclinic effects); Space and time varying atmospheric pressure/ wind on the water surface; Drying and flooding of tidal flats; Influence of waves on the bed shear-stress and mass fluxes. Domain decomposition is available to achieve higher spatial resolution if required.

Sediment transport

The sediment transport and morphology module supports both bedload and suspended load transport of non-cohesive sediments and suspended load of cohesive sediments.

Morphological evolution

Deposition and erosion are calculated, and bottom changes are coupled with the hydrodynamic. Possible use of morphological scale factor for long-term simulations.

Model developed until now for this project:

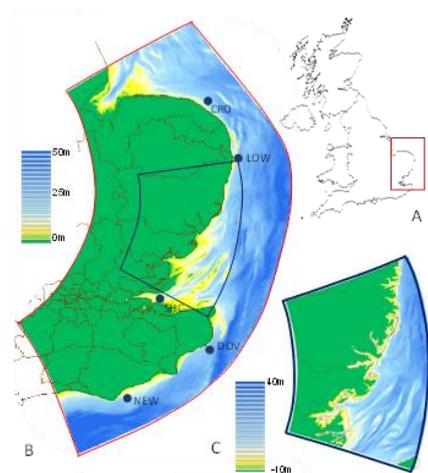


Figure 1 Numerical model bathymetry and domain. Model is made of two nested subdomains (red and blue contours). Smaller domain (blue contour) is higher resolution. Forcing along the red contour are from another large scale model (CS3X). Variable pressure and wind data are from MET. Bathymetry data from the EDINA-digimap website. LIDAR data at the coastline are from the Environmental agency website. Years available June 2008- July 2009; June 2013- July 2014.

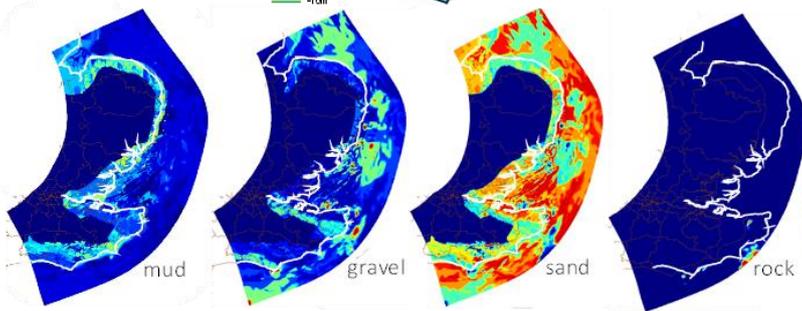


Figure 2 Sediment bed composition as incorporated into the model. Different colours represent different percentage of the sediment fraction (0 to 1). Data retrieved from BGS.

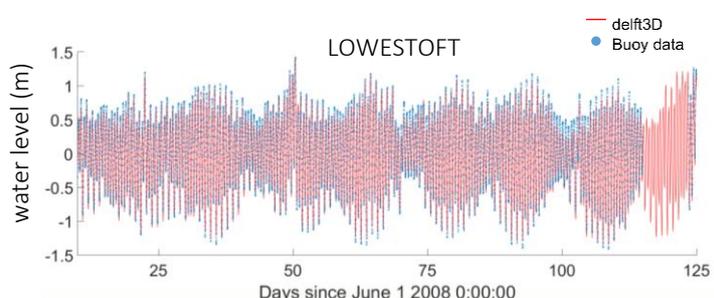
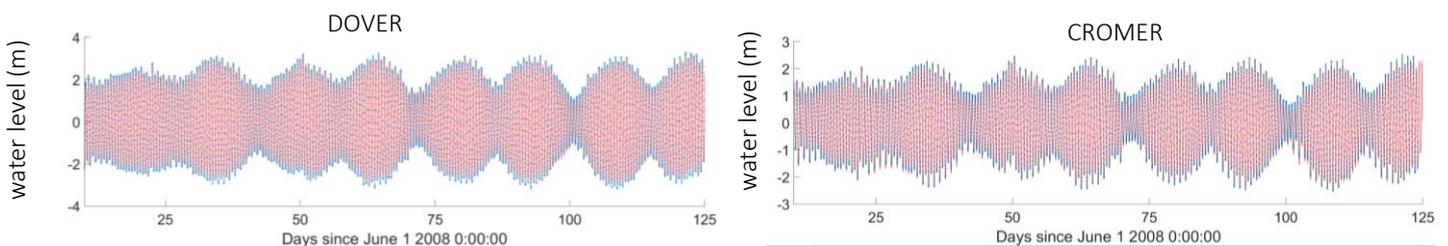


Figure 3 example calibration at 3 stations (Dover, Cromer, Lowestoft). Red is the model; blue dots are buoy data.